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TITLE: MANUFACTURE OF PERMANENT MAGNET ROTOR

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ABSTRACT:

PURPOSE: To transmit the torque sufficiently by a structure wherein the protruding parts, provided on the outer peripheral surface of a shaft, provide a uniform gap between a permanent magnet and the shaft and an adhesive is injected uniformly into the gap to prevent the waste of the adhesive.

CONSTITUTION: A plurality of protrusions 23, each having an acute tip, are provided at a substantially constant interval on the outer periphery of a magnet fixing part where a permanent magnet 1 is fitted over a shaft 2. The diameter connecting the tips of protrusions 23 is set slightly longer than the inner diameter of the permanent magnet 1. When the permanent magnet 1 and the shaft 2 are assembled, the shaft 2 is press fitted in the permanent magnet 1. The tip of each protrusion 23 is crushed by the inner periphery of the permanent magnet but the root of each protrusion 23 is intact thus providing a uniform gap G over the entire periphery between the outer peripheral surface of the shaft 2 and the inner peripheral surface of the permanent magnet 1.

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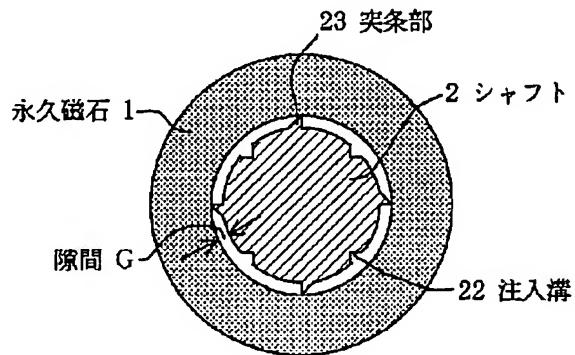
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(54) 【発明の名称】 永久磁石形回転子の製造方法

(57) 【要約】

【構成】 シャフト2の外周に中空円筒状の永久磁石1を固定する永久磁石形回転子の製造方法において、シャフト2の永久磁石1が固定される磁石固定部21の外周に軸方向に伸びる複数の突条部23を円周方向にほぼ等間隔に設け、突条部23の先端を鋭角に形成し、かつ先端を結ぶ直径が永久磁石1の内径より僅かに大きく形成し、永久磁石1の内側にシャフト2を圧入し、シャフト2と永久磁石1との間に形成された隙間に接着剤を充填するものである。

【効果】 シャフトと永久磁石との間に形成された隙間に注入する接着剤の厚みが均一となり、接着剤を無駄なく充填し、十分なトルクを伝達できる。



1

【特許請求の範囲】

【請求項1】 シャフトの外周に中空円筒状の永久磁石を固定する永久磁石形回転子の製造方法において、前記シャフトの前記永久磁石が固定される磁石固定部の外周に軸方向に伸びる複数の突条部を円周方向にほぼ等間隔に設け、前記突条部の先端を鋭角に形成し、かつ前記先端を結ぶ直径が前記永久磁石の内径より僅かに大きく形成し、前記永久磁石の内側に前記シャフトを圧入し、前記シャフトと前記永久磁石との間に形成された隙間に接着剤を充填することを特徴とする永久磁石形回転子の製造方法。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、回転電機の永久磁石形回転子の製造方法に関し、とくにシャフトと永久磁石の固定方法に関する。

【0002】

【従来の技術】 従来、回転子のシャフトの外周に中空円筒状の永久磁石を固定する場合、例えば図3に示すように、永久磁石1とシャフト2を位置決めするため、シャフト2の永久磁石1を固定する磁石固定部21の外周に、軸方向に伸びる注入溝22を設けておき、位置決め治具3に永久磁石1とシャフト2とを装着する。次に、永久磁石1とシャフト2との間の隙間Gに、注入溝22を介して接着剤4を注入する方法が採られている。位置決め治具3は、永久磁石1が円滑に挿入されるように、永久磁石1の外径より僅かに大きい内径を有する磁石保持部31と、シャフト1の軸端を永久磁石1と同心になるように保持するシャフト保持部32とからなっている。

【0003】

【発明が解決しようとする課題】 ところが、従来技術では、永久磁石1をシャフト2に挿入した状態で位置決め治具3によって位置決めし、シャフト2の外周と永久磁石1の内周との間の隙間に接着剤を充填するが、永久磁石1の外周と位置決め治具3の磁石保持部31の内周との間に僅かに隙間が生じて、磁石保持部31の中で永久磁石1が僅かに偏ることがあった。また、シャフト2をシャフト端部で保持するため、僅かにシャフト2が倒れて、シャフト2に永久磁石1が固定されるシャフト2の中央部が永久磁石1に対して偏心することがあった。そのため、永久磁石1とシャフト2との間の隙間を均一に保持することが難しく、部分的に接着剤がそぎ落とされて、隙間に接着剤が十分充填されず、均一な接着層を形成することができないので、永久磁石からシャフトに十分なトルクを伝達できないという問題があった。本発明は、シャフトと永久磁石の間の隙間を均一に保ち、接着剤を無駄なく充填し、十分なトルクを伝達できる永久磁石形回転子を製造することを目的とするものである。

【0004】

10

【課題を解決するための手段】 上記問題を解決するため、本発明は、シャフトの外周に中空円筒状の永久磁石を固定する永久磁石形回転子の製造方法において、前記シャフトの前記永久磁石が固定される磁石固定部の外周に軸方向に伸びる複数の突条部を円周方向にほぼ等間隔に設け、前記突条部の先端を鋭角に形成し、かつ前記先端を結ぶ直径が前記永久磁石の内径より僅かに大きく形成し、前記永久磁石の内側に前記シャフトを圧入し、前記シャフトと前記永久磁石との間に形成された隙間に接着剤を充填するものである。

【0005】

【作用】 上記手段により、永久磁石をシャフトに押し込むと、シャフトの外周面に円周方向にほぼ等間隔に設けた突条部がほぼ均一な隙間を形成するので、注入溝を介して注入された接着剤は、ほぼ均一な厚みを備えた接着層を形成することができる。

【0006】

【実施例】 以下、本発明を図に示す実施例について説明する。図1は本発明の実施例を示す平断面図、図2はその側断面図である。図において、中空円筒状の永久磁石1がシャフト2に挿入される磁石固定部21の外周に、軸方向に伸び、かつ先端が鋭角の複数の突条部23を円周方向にほぼ等間隔に設けてある。突条部23の先端を結ぶ直径は、永久磁石1の内径より僅かに大きくしてある。なお、シャフト2の永久磁石1が挿入される外周面には、従来例と同様に軸方向に伸びる注入溝22を円周方向にほぼ等間隔に複数個設けてある。永久磁石1とシャフト2を組み立てる場合、永久磁石1の内側にシャフト2を圧入する。このとき、各突条部23の先端は永久磁石1の内周によって潰されるが、各突条部23の根元部分はその形状を保つので、シャフトの外周面と永久磁石1の内周面との間にはほぼ全周にわたって、均一な隙間Gを形成することができる。永久磁石1とシャフト2を組み立てた状態で位置決め治具に装着し、シャフト2に形成した注入溝22から接着剤を注入すると、接着剤は注入溝22および突条部23に沿って流れ、均一な隙間Gに接着剤が充填されるので、均一な厚みを備えた接着層を形成することができる。

【0007】

【発明の効果】 以上述べたように、本発明によれば、シャフトの外周面に設けた突条部が永久磁石とシャフトとの間にほぼ均一な隙間を形成するので、隙間に注入する接着剤の厚みが均一となり、接着剤を無駄なく充填し、十分なトルクを伝達できる永久磁石形回転子を製造できる効果がある。

【図面の簡単な説明】

【図1】 本発明の実施例を示す平断面図である。

【図2】 本発明の実施例を示す側断面図である。

【図3】 従来例を示す側断面図である。

50 【符号の説明】

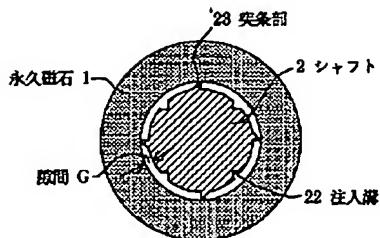
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1 永久磁石、2 シャフト、21 磁石固定部、22 注入溝

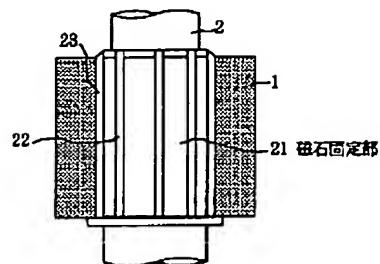
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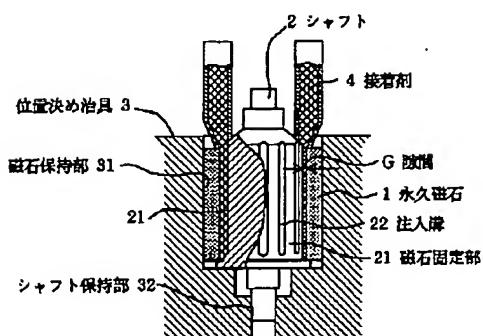
【図1】



【図2】



【図3】



PATENT ABSTRACTS OF JAPAN

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(21) Application number : **06-133780** (71) Applicant : **YASKAWA ELECTRIC CORP**

(22) Date of filing : **23.05.1994** (72) Inventor : **SUZUKI TSURUJI**

(54) MANUFACTURE OF PERMANENT MAGNET ROTOR

(57) Abstract:

PURPOSE: To transmit the torque sufficiently by a structure wherein the protruding parts, provided on the outer peripheral surface of a shaft, provide a uniform gap between a permanent magnet and the shaft and an adhesive is injected uniformly into the gap to prevent the waste of the adhesive.

CONSTITUTION: A plurality of protrusions 23, each having an acute tip, are provided at a substantially constant interval on the outer periphery of a magnet fixing part where a permanent magnet 1 is fitted over a shaft 2. The diameter connecting the tips of protrusions 23 is set slightly longer than the inner diameter of the permanent magnet 1. When the permanent magnet 1 and the shaft 2 are assembled, the shaft 2 is press fitted in the permanent magnet 1. The tip of each protrusion 23 is crushed by the inner periphery of the permanent magnet but the root of each protrusion 23 is intact thus providing a uniform gap G over the entire periphery between the outer peripheral surface of the shaft 2 and the inner peripheral surface of the permanent magnet 1.

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CLAIMS

[Claim(s)]

[Claim 1] In the manufacture approach of the permanent magnet form rotator which fixes a bell shape permanent magnet to the periphery of a shaft Two or more protruding line sections extended to shaft orientations at the periphery of the magnet fixed part to which said permanent magnet of said shaft is fixed are mostly prepared in a circumferential direction at equal intervals. The diameter which forms the tip of said protruding line section in an acute angle, and connects said tip forms greatly slightly from the bore of said permanent magnet. The manufacture approach of the permanent magnet form rotator characterized by filling up with adhesives the clearance which pressed said shaft fit inside said permanent magnet, and was formed between said shafts and said permanent magnets.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] Especially this invention relates to the fixed approach of a shaft and a permanent magnet about the manufacture approach of the permanent magnet form rotator of a dynamo-electric machine.

[0002]

[Description of the Prior Art] In order to position a permanent magnet 1 and a shaft 2 as shown in drawing 3 when it fixes a bell shape permanent magnet to the periphery of the shaft of a rotator conventionally for example, the impregnation slot 22 extended to shaft orientations is established in the periphery of the magnet fixed part 21 which fixes the permanent magnet 1 of a shaft 2, and the positioning fixture 3 is equipped with a permanent magnet 1 and a shaft 2. Next, the method of pouring adhesives 4 into the clearance G between a permanent magnet 1 and a shaft 2 through the impregnation slot 22 is taken. As for the positioning fixture 3, the permanent magnet 1 consists of a magnet

attaching part 31 which has a slightly larger bore than the outer diameter of a permanent magnet 1, and a shaft attaching part 32 which holds the axis end of a shaft 1 so that it may become a permanent magnet 1 and this alignment so that may be inserted smoothly. [0003]

[Problem(s) to be Solved by the Invention] However, although it positioned with the positioning fixture 3 where a permanent magnet 1 is inserted in a shaft 2, and adhesives were filled up with the conventional technique into the clearance between the periphery of a shaft 2, and the inner circumference of a permanent magnet 1, between the periphery of a permanent magnet 1, and the inner circumference of the magnet attaching part 31 of the positioning fixture 3, the clearance might be generated slightly and the permanent magnet 1 might incline slightly in the magnet attaching part 31. Moreover, since a shaft 2 was held at the shaft edge, the shaft 2 fell slightly and the center section of the shaft 2 where a permanent magnet 1 is fixed to a shaft 2 might carry out eccentricity to the permanent magnet 1. Therefore, since it was difficult to hold the clearance between a permanent magnet 1 and a shaft 2 to homogeneity, and adhesives failed to be diminished partially, a clearance was not enough filled up with adhesives and a uniform glue line could not be formed, there was a problem that sufficient torque for a shaft could not be transmitted from a permanent magnet. This invention maintains the clearance between a shaft and a permanent magnet at homogeneity, is filled up with adhesives without futility, and aims at manufacturing the permanent magnet form rotator which can transmit sufficient torque.

[0004]

[Means for Solving the Problem] In the manufacture approach of a permanent magnet form rotator that this invention fixes a bell shape permanent magnet to the periphery of a shaft in order to solve the above-mentioned problem Two or more protruding line sections extended to shaft orientations at the periphery of the magnet fixed part to which said permanent magnet of said shaft is fixed are mostly prepared in a circumferential direction at equal intervals. The diameter which forms the tip of said protruding line section in an acute angle, and connects said tip forms greatly slightly from the bore of said permanent magnet, presses said shaft fit inside said permanent magnet, and fills up with adhesives the clearance formed between said shafts and said permanent magnets.

[0005]

[Function] If a permanent magnet is stuffed into a shaft, since the protruding line section prepared mostly at equal intervals will form an almost uniform clearance in a circumferential direction with the above-mentioned means at the peripheral face of a shaft, the adhesives poured in through the impregnation slot can form the glue line equipped with almost uniform thickness.

[0006]

[Example] Hereafter, the example which shows this invention in drawing is explained. The plane section Fig. in which drawing 1 shows the example of this invention, and drawing 2 are the sectional side elevation. In drawing, it forms in shaft orientations at the periphery of the magnet fixed part 21 by which the bell shape permanent magnet 1 is inserted in a shaft 2, and elongation and a tip have formed mostly two or more protruding line sections 23 of an acute angle in the circumferential direction at equal intervals. The diameter which connects the tip of the protruding line section 23 is slightly enlarged from the bore of a permanent magnet 1. In addition, two or more impregnation slots 22

extended to shaft orientations as well as [the peripheral face in which the permanent magnet 1 of a shaft 2 is inserted] the conventional example are mostly established in the circumferential direction at equal intervals. When assembling a permanent magnet 1 and a shaft 2, a shaft 2 is pressed fit inside a permanent magnet 1. Although the tip of each protruding line section 23 is crushed by the inner circumference of a permanent magnet 1 at this time, since the amount of [of each protruding line section 23] root Motobe maintains that configuration, between the peripheral face of a shaft, and the inner skin of a permanent magnet 1, it can go over it mostly at the perimeter, and it can form the uniform clearance G. Since a positioning fixture is equipped where a permanent magnet 1 and a shaft 2 are assembled, adhesives will flow along with the impregnation slot 22 and the protruding line section 23 if adhesives are poured in from the impregnation slot 22 formed in the shaft 2, and the uniform clearance G is filled up with adhesives, the glue line equipped with uniform thickness can be formed.

[0007]

[Effect of the Invention] Since the protruding line section prepared in the peripheral face of a shaft forms an almost uniform clearance between a permanent magnet and a shaft according to this invention as stated above, the thickness of the adhesives poured into a clearance becomes uniform, and it is filled up with adhesives without futility, and is effective in the ability to manufacture the permanent magnet form rotator which can transmit sufficient torque.

TECHNICAL FIELD

[Industrial Application] Especially this invention relates to the fixed approach of a shaft and a permanent magnet about the manufacture approach of the permanent magnet form rotator of a dynamo-electric machine.

PRIOR ART

[Description of the Prior Art] In order to position a permanent magnet 1 and a shaft 2 as shown in drawing 3 when it fixes a bell shape permanent magnet to the periphery of the shaft of a rotator conventionally for example, the impregnation slot 22 extended to shaft orientations is established in the periphery of the magnet fixed part 21 which fixes the permanent magnet 1 of a shaft 2, and the positioning fixture 3 is equipped with a permanent magnet 1 and a shaft 2. Next, the method of pouring adhesives 4 into the clearance G between a permanent magnet 1 and a shaft 2 through the impregnation slot 22 is taken. As for the positioning fixture 3, the permanent magnet 1 consists of a magnet attaching part 31 which has a slightly larger bore than the outer diameter of a permanent magnet 1, and a shaft attaching part 32 which holds the axis end of a shaft 1 so that it may become a permanent magnet 1 and this alignment so that may be inserted smoothly.

EFFECT OF THE INVENTION

[Effect of the Invention] Since the protruding line section prepared in the peripheral face of a shaft forms an almost uniform clearance between a permanent magnet and a shaft according to this invention as stated above, the thickness of the adhesives poured into a clearance becomes uniform, and it is filled up with adhesives without futility, and is effective in the ability to manufacture the permanent magnet form rotator which can transmit sufficient torque.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, although it positioned with the positioning fixture 3 where a permanent magnet 1 is inserted in a shaft 2, and adhesives were filled up with the conventional technique into the clearance between the periphery of a shaft 2, and the inner circumference of a permanent magnet 1, between the periphery of a permanent magnet 1, and the inner circumference of the magnet attaching part 31 of the positioning fixture 3, the clearance might be generated slightly and the permanent magnet 1 might incline slightly in the magnet attaching part 31. Moreover, since a shaft 2 was held at the shaft edge, the shaft 2 fell slightly and the center section of the shaft 2 where a permanent magnet 1 is fixed to a shaft 2 might carry out eccentricity to the permanent magnet 1. Therefore, since it was difficult to hold the clearance between a permanent magnet 1 and a shaft 2 to homogeneity, and adhesives failed to be diminished partially, a clearance was not enough filled up with adhesives and a uniform glue line could not be formed, there was a problem that sufficient torque for a shaft could not be transmitted from a permanent magnet. This invention maintains the clearance between a shaft and a permanent magnet at homogeneity, is filled up with adhesives without futility, and aims at manufacturing the permanent magnet form rotator which can transmit sufficient torque.

MEANS

[Means for Solving the Problem] In the manufacture approach of a permanent magnet form rotator that this invention fixes a bell shape permanent magnet to the periphery of a shaft in order to solve the above-mentioned problem Two or more protruding line sections extended to shaft orientations at the periphery of the magnet fixed part to which said permanent magnet of said shaft is fixed are mostly prepared in a circumferential direction at equal intervals. The diameter which forms the tip of said protruding line section in an acute angle, and connects said tip forms greatly slightly from the bore of said permanent magnet, presses said shaft fit inside said permanent magnet, and fills up with adhesives the clearance formed between said shafts and said permanent magnets.

EXAMPLE

[Example] Hereafter, the example which shows this invention in drawing is explained. The plane section Fig. in which drawing 1 shows the example of this invention, and drawing 2 are the sectional side elevation. In drawing, it forms in shaft orientations at the periphery of the magnet fixed part 21 by which the bell shape permanent magnet 1 is inserted in a shaft 2, and elongation and a tip have formed mostly two or more protruding line sections 23 of an acute angle in the circumferential direction at equal intervals. The diameter which connects the tip of the protruding line section 23 is slightly enlarged from the bore of a permanent magnet 1. In addition, two or more impregnation slots 22 extended to shaft orientations as well as [the peripheral face in which the permanent magnet 1 of a shaft 2 is inserted] the conventional example are mostly established in the circumferential direction at equal intervals. When assembling a permanent magnet 1 and a shaft 2, a shaft 2 is pressed fit inside a permanent magnet 1. Although the tip of each protruding line section 23 is crushed by the inner circumference of a permanent magnet 1 at this time, since the amount of [of each protruding line section 23] root Motobe maintains that configuration, between the peripheral face of a shaft, and the inner skin of a permanent magnet 1, it can go over it mostly at the perimeter, and it can form the uniform clearance G. Since a positioning fixture is equipped where a permanent magnet 1 and a shaft 2 are assembled, adhesives will flow along with the impregnation slot 22 and the protruding line section 23 if adhesives are poured in from the impregnation slot 22 formed in the shaft 2, and the uniform clearance G is filled up with adhesives, the glue line equipped with uniform thickness can be formed.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the plane section Fig. showing the example of this invention.

[Drawing 2] It is the sectional side elevation showing the example of this invention.

[Drawing 3] It is the sectional side elevation showing the conventional example.

[Description of Notations]

1 Permanent Magnet, 2 Shaft, 21 Magnet Fixed Part, 22 Impregnation Slot, 23 Protruding Line Section,